# NEW RECORDS OF JAPYGOIDEA (HEXAPODA: DIPLURA) FROM LOUISIANA, WITH NOTES ON BEHAVIOR[1]

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ABSTRACT: Previous published records of the hexapod order Diplura from Louisiana have documented one species. We provide collection data for seven species of Japygoidea: five within Japygidae and two within Parajapygidae. Two genera and four species of Louisiana Japygidae are undescribed. Members of Japygidae are saprophagous and predatory in feeding behavior. Cerci were not used during any observations of prey capture, but were employed defensively as pincers.

Japygoids are a primitive group of blind, flightless hexapods belonging to the class Diplura. The bionomics of this obscure group of hexapods remain poorly known. Japygoids have been recorded primarily from mesic habitats beneath rocks, rotting logs, leaf litter, humus, and soil. Some species occur in xeric habitats and three species are obligate cavernicoles (Muegge, 1992; Pagés, 1972, 1977).

Japygids are prone to extreme endemism (Allen, 1988; Muegge, 1992; Muegge and Bernard, 1989; Smith, 1960). Their relatively small size, wingless and eyeless anatomy, and the occurrence of most species in edaphic habitats contribute to this tendency toward endemism. Thus, while Diplura and similar cryptic organisms could be useful in providing insight into biogeographic patterns, particularly in identifying areas of endemism, an almost total lack of information about their distributions and regional diversity is a barrier to accomplishing this goal. The information presented here is part of a continuing effort to document the distributional patterns and systematic status of Japygoidea in North America and provide information about their biology.

Voucher specimens of taxa reported here are deposited in the Louisiana State Arthropod Museum and the first author's collection.

## BEHAVIORAL NOTES

Observations of behavior and examination of gut contents by one of us (MAM) indicate that japygoids are generally saprophagous and predatory, pursuing and consuming live prey opportunistically. Examinations of the gut

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contents of numerous specimens of several species revealed an abundance of arthropod body parts, primarily from springtails and mites, and a significant amount of undigested, unrecognizable organic matter.

The japygid *Metajapyx remingtoni* Smith and Bolton was observed during prey stalking and capture. The long musculated antennae were used to search for prey. Once a potential prey item was detected, the animal slowly crept to within striking distance, then lunged forward to capture, subdue, and consume the prey. Individuals of *M. remingtoni* were observed capturing and consuming entomobryid springtails. The feeding habits of *Japyx* sp. were studied by Pagés (1951), who reported predation on an isopod, *Platyarthrus hoffmanseggti* Brandt and the following gut contents: isopods, mites (mainly oribatids and gamasids), Symphyla, japygids, Diptera larvae, adult beetles, vegetable debris, and mycelia. Schaller (1968) described the use of forceps during prey capture and depicted it in a pair of drawings, but provided no observational data or references to support the description. Kuhnelt (1976) published a similar drawing depicting the capture of a campodid dipluran using the forceps. Finally, Conde and Pagés (1991) reported that individuals of *Heterojapyx* sp. were observed buried in soil with cerci exposed, waiting to capture small arthropods that came within reach using the cerci. However, they did not state whether they observed the cerci being used in this manner.

Thus, there are numerous reports in the literature suggesting that japygoids use their cercal forceps during prey capture, but these reports are not supported by detailed observational data. We have observed forceps being used in defensive behavior on several occasions, but never during prey capture. The tenth abdominal segment and forceps are heavily sclerotized, musculated, and quite powerful considering the size of the animal. Japygids under duress were observed grasping and completely severing the bodies of other similar sized arthropods using the forceps. These animals were never consumed during our observations.

## NEW RECORDS FROM LOUISIANA

(Fig. 1)

**Family JAPYGIDAE**

***Mixojapyx tridenticulatus*** (Fox). Specimens examined, 21. Avoyelles Parish, near Hamburg, 2 July 1979, H. Lambert, habitat: in soil, 1 female. East Feliciana Parish, Idlewild Research Station, 15 January 1989, M. A. Muegge, habitat: in moist soil at base of *Quercus* sp., mixed oak/pine forest, 1 male, 1 female. Same data, 3 June 1989, base of *Pinus* sp. 1 male. Same data, 23 January 1990, 1 male. Same data, 1 March 1990, 1 female. Same data, 13 February 1991, 2 males, 4 females. Grant Parish, Kisatchie National Forest, 29 March 1992, M. A. Muegge, habitat: moist soil, mixed beech/magnolia forest, 1 male, 3 females. Natchitoches Parish, Kisatchie National Forest, Red Dirt National Wildlife Management Area, 1 April 1989, M. A. Muegge, habitat: in soil beneath rock, primarily long-leaf pine forest. Same data, 10 June 1991, M. A. Muegge, 1 female. St. Landry Parish, Thistlewaite Wildlife Management Area, 14 January 1989, M. A. Muegge, habitat: in moist sandy soil, pine/oak forest, 1 male, 1 female. Same data, 27

January 1990, 1 female. Washington Parish, near Southeast Research Station, 25 January 1990, M. A. Muegge, habitat: about 25 cm deep in moist soil near *Pinus* sp. along roadside, 1 female.

Range. Gulf Coast States.

**Comments.** *Mixojapyx tridenticulatus* is the only species of this primarily Mexican genus found in Louisiana. It has the widest distribution of any *Mixojapyx* species north of Mexico, occurring in the gulf coastal region from east Texas to Florida. The specimens examined from east of the Mississippi River display slight, but consistent chaetotaxic differences from those west of the Mississippi River. Upon further investigation, these two populations may be found to represent distinct species.

***Metajapyx* undescribed species 1.** Specimens examined. 26. East Feliciana Parish, Idlewild Research Station, 1 March 1990, M. A. Muegge, habitat: moist soil, mixed oak/pine forest, 2 males, 5 females. Same data, 27 February 1990, 3 males, 3 females. Same data, 1-3 March 1991, 4 males, 7 females. Same data, 13 February 1991, except habitat. under rotting log near stream bank, 1 male, 1 female.

Range. Known only from the above locality.

**Comments.** *Metajapyx* is a widespread genus reported almost exclusively from locations east of the Mississippi River (Reddell, 1983). Rathman et al. (1988) reported an undescribed *Metajapyx* species from eastern Washington State, but some characters needed to confirm the identification were not described. Thus, further study will be required to determine its correct generic placement. Fox (1941) and Smith (1960) reported *M. subterraneus* from Oregon and Stoddard counties, Missouri, respectively, and these are the only reliable records of the genus west of the Mississippi River. In Louisiana, specimens of *Metajapyx* have only been found east of the Mississippi River.

***Metajapyx* undescribed species 2.** Specimens examined, 17. East Feliciana Parish, Idlewild Research Station, 3 June 1989, M. A. Muegge, habitat: in moist soil and litter at base of *Pinus* sp, mixed oak/pine forest, 1 male, 16 females.

Range. Known only from the above locality.

**Comments.** This and the preceding species are being described in a revision of *Metajapyx* currently underway.

**Undescribed genus and species 1.** Specimens examined, 1. Caddo Parish. Shreveport, 4634 Dixie Blvd., 12 December 1993, J. T. McBride and V. L. Moseley, habitat: under rotting wood in urban backyard, 1 male.

Range. Known only from the above locality.

**Comments.** The discovery of this undescribed genus in an urban habitat was unexpected. Chaetotaxy, structure of the subcoxal organs, and structure of the cerci suggest that this individual represents a distinct and undescribed genus.

**Undescribed genus and species 2.** Specimens examined, 1. Webster Parish, Kisatchie National Forest, 22 March 1990, M. A. Muegge, habitat: soil at base of *Pinus* sp., moist mixed oak/pine forest, 1 male.

Range. Ouachita Highlands of eastern Oklahoma and Arkansas, south to northwestern Louisiana.

**Comments.** Many specimens representing several species in this undescribed genus have been collected by the authors and others from Arkansas and Oklahoma. The individual collected in northern Louisiana may represent the southernmost limit of the genus' range. Further study is underway to determine the number of species in the genus.

**Family PARAJAPYGIDAE**

**Parajapyx (Parajapyx) isabellae** (Grassi). Specimens examined, 62, not sorted by sex. Acadia Parish, 15 October 1964, W. Sonnier, habitat: soil from sweet potato field. Acadia Parish, LSU Rice Research Station near Crowley, 12 June 1994, M. A. Muegge, habitat: soil sample from rice field. Avoyelles Parish, near Hamburg, 2 July 1979, H. Lambert, habitat: soil, 1 specimen. Bienville Parish, near Lake Bistineau, 1 August 1990, M. A. Muegge, habitat: soil, mixed oak/pine forest, 2 specimens. East Baton Rouge Parish, 11 March 1982, P. J. Barbour, habitat: soil/leaf litter berlesate. East Feliciana Parish, Idlewild Research Station near Clinton, 28 May 1989, M. A. Muegge, habitat: sandy soil near stream, mixed beech/magnolia forest, 6 specimens. Same data, 30 July 1989, 11 specimens. Same data, 9 February 1991, 12 specimens from sandy soil near stream, 9 specimens from soil near decaying log. Same data, 30 June 1991, soil near *Pinus* sp. St. Landry Parish, 15 July 1979, C. E. Eastman, habitat: soil. Same, except near Port Barre, 22 June 1982, 2 specimens. Webster Parish, Kisatchie National Forest, 22 March 1990, M. A. Muegge, habitat: in soil near *Pinus* sp., mixed forest, 2 specimens.

Range. Cosmopolitan.

**Comments.** The only previously published references to Japygoids from Louisiana were made by Ingram (1931), Ingram et al. (1950), and Fox (1957). These specimens were reported only as *Japyx* sp. Ingram (1931) and Ingram et al. (1950) reported that specimens of *Japyx* sp. were commonly found in sugarcane fields, and suggested that they could be potential pests, causing damage by feeding on the root systems of the plant. Although we have not examined any specimens collected by Ingram, we agree with Reddell (1983) that these records represent *P. isabellae*. This species is widespread and common, and is the only japygoid that is commonly collected in agricultural monocultures.

***Parajapyx (Grassjapyx) grassianus "maiusculella"*** Silvestri. Specimens examined, 12. East Feliciana Parish, Idlewild Research Station near Clinton, 9 February 1989, M. A. Muegge, habitat: sandy soil near stream, mixed beech/magnolia forest, 2 specimens. Same data, 30 July 1989, 1 specimen. Same data, 30 July 1991, soil at base of *Pinus* sp., 2 specimens. Same data 9 February 1991, 7 specimens.

Range. Coastal Louisiana to Florida.

**Comments.** The taxonomic status of the *P. grassianus* is uncertain. The type locality for *P. grassianus* is Córdoba, Veracruz, Mexico (Silvestri, 1911) and it has been recorded only from locations in Mexico. Silvestri (1948) subsequently described one form, "forma vel mutans", and two variations of that form, "maiusculella" and "robustior", from Florida These descriptions were based primarily on cercal dentation. Based on cercal dentation, the specimens

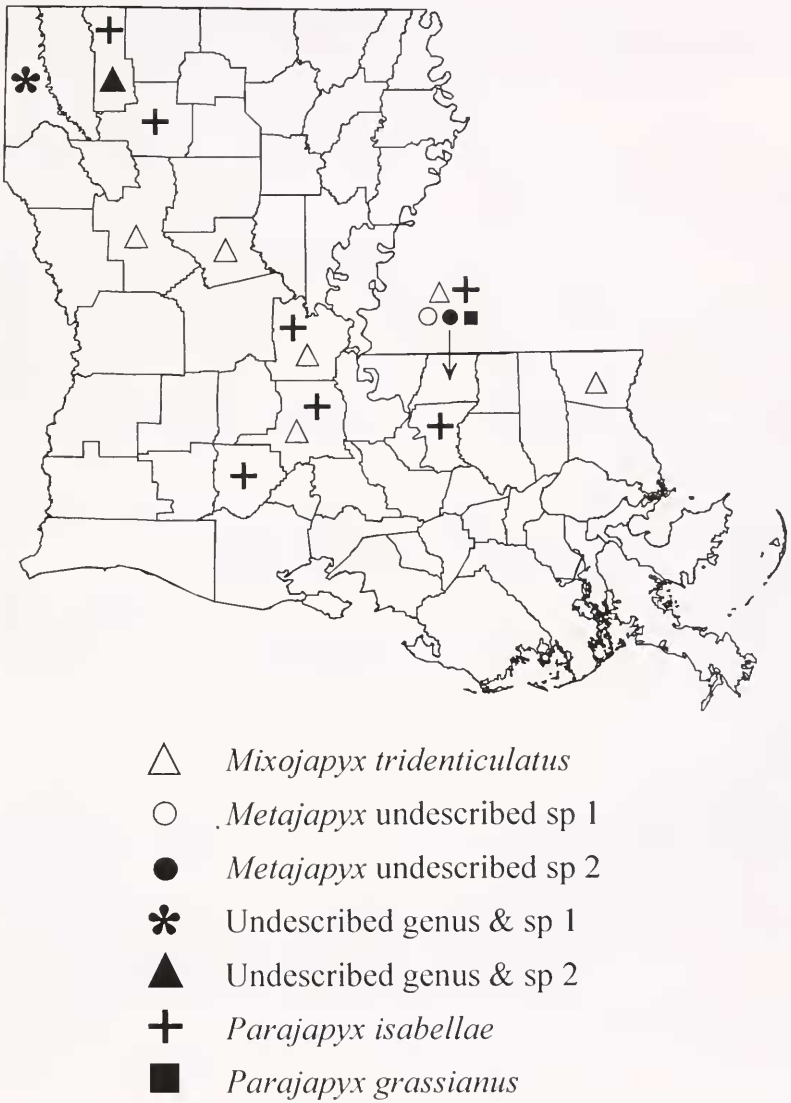


Figure 1. Collecting localities of Japygoidea recorded from Louisiana.

from Louisiana represent the variant "maiusculella". Further study is necessary to determine if the Florida and Louisiana specimens represent undescribed species, or geographical variants of *P. grassianus*.

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